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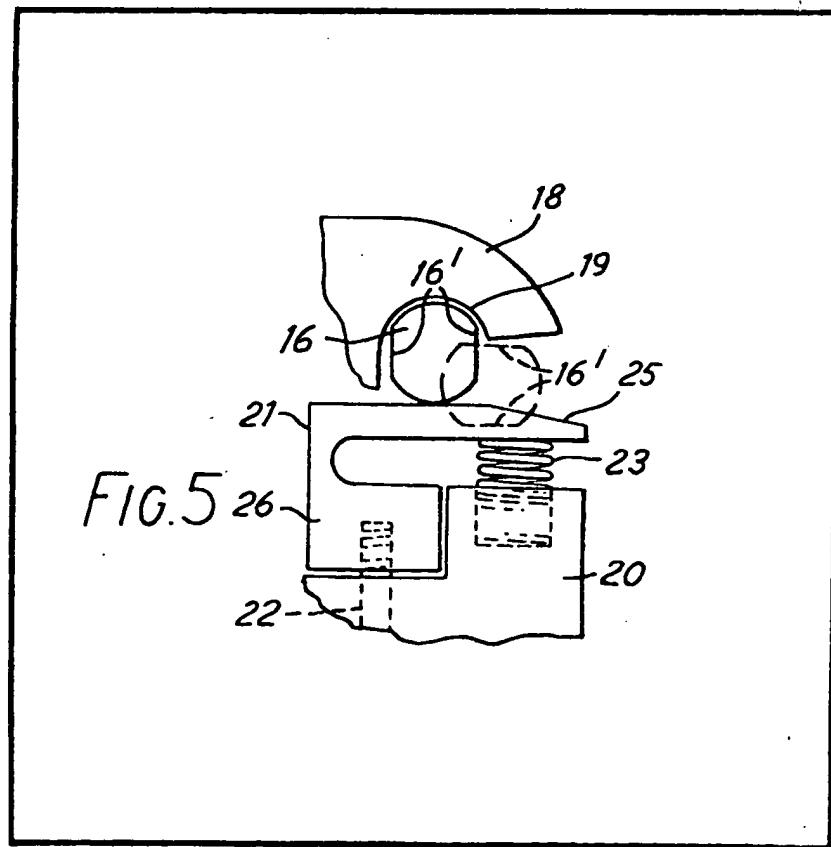
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(54) Hinges

(57) A hinge has two separable parts for hingedly connecting two objects. One part has a pin (16) which is rigidly connected to one object. The other part has at least one locating member (18) connected to the second object and having a surface (19) against

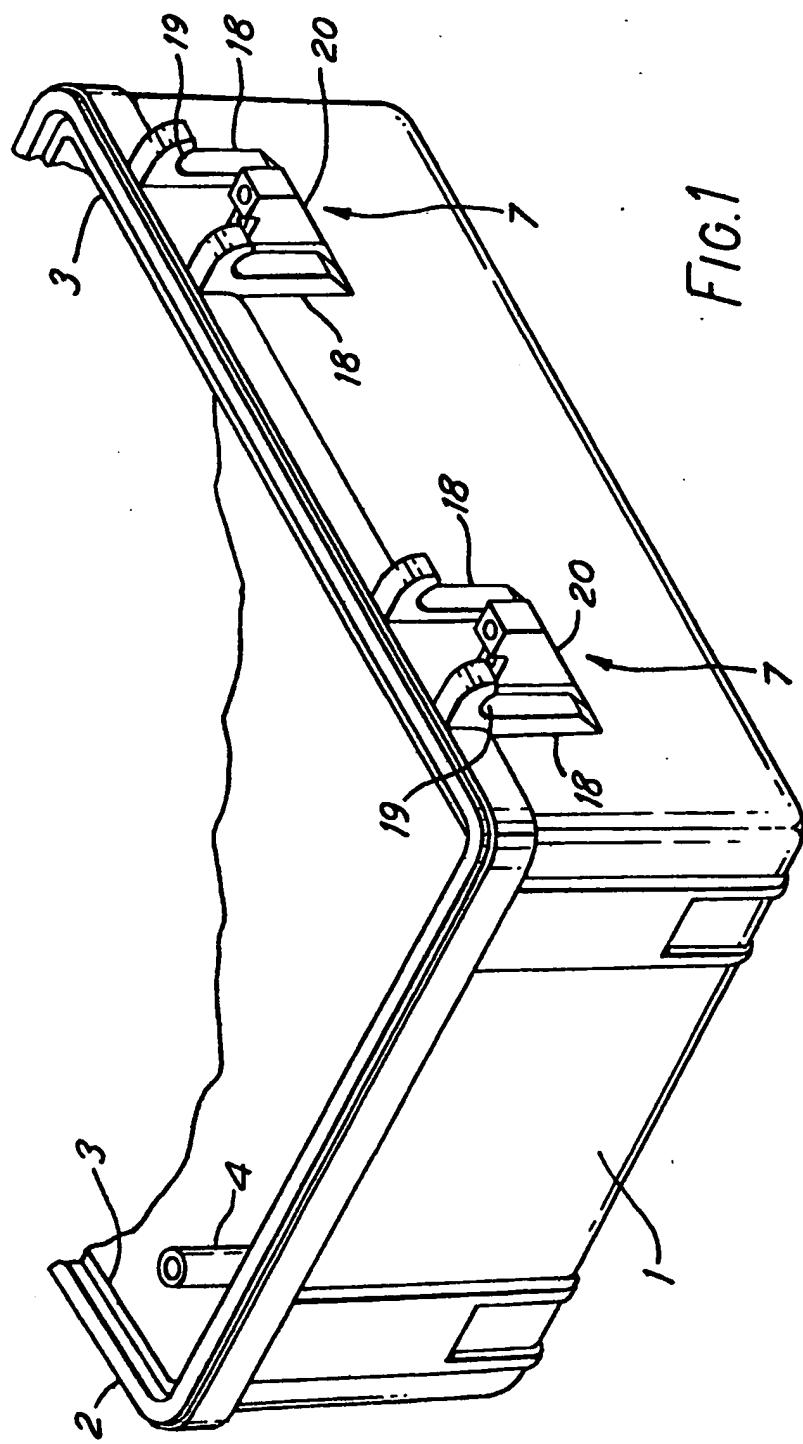
which the pin locates. A member 21 with a tongue (25) urged by a spring (23) retains the pin against the surface and the firmness of retention can be varied by the use of different springs. The pin also has at least one flat (16) to allow easier release and assembly in at least one relative position of the two parts. The two parts may be the lid and base of a box.

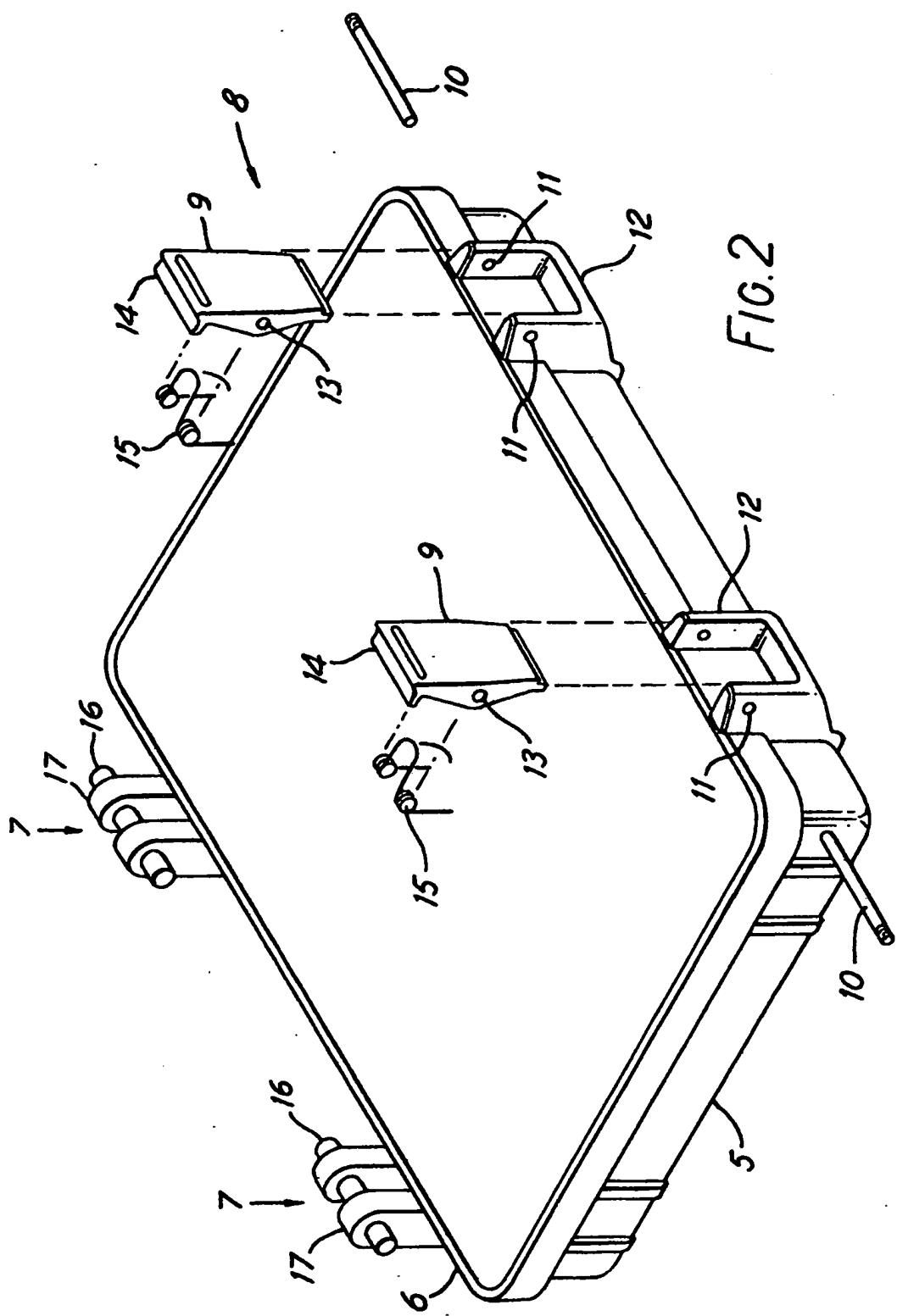


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The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

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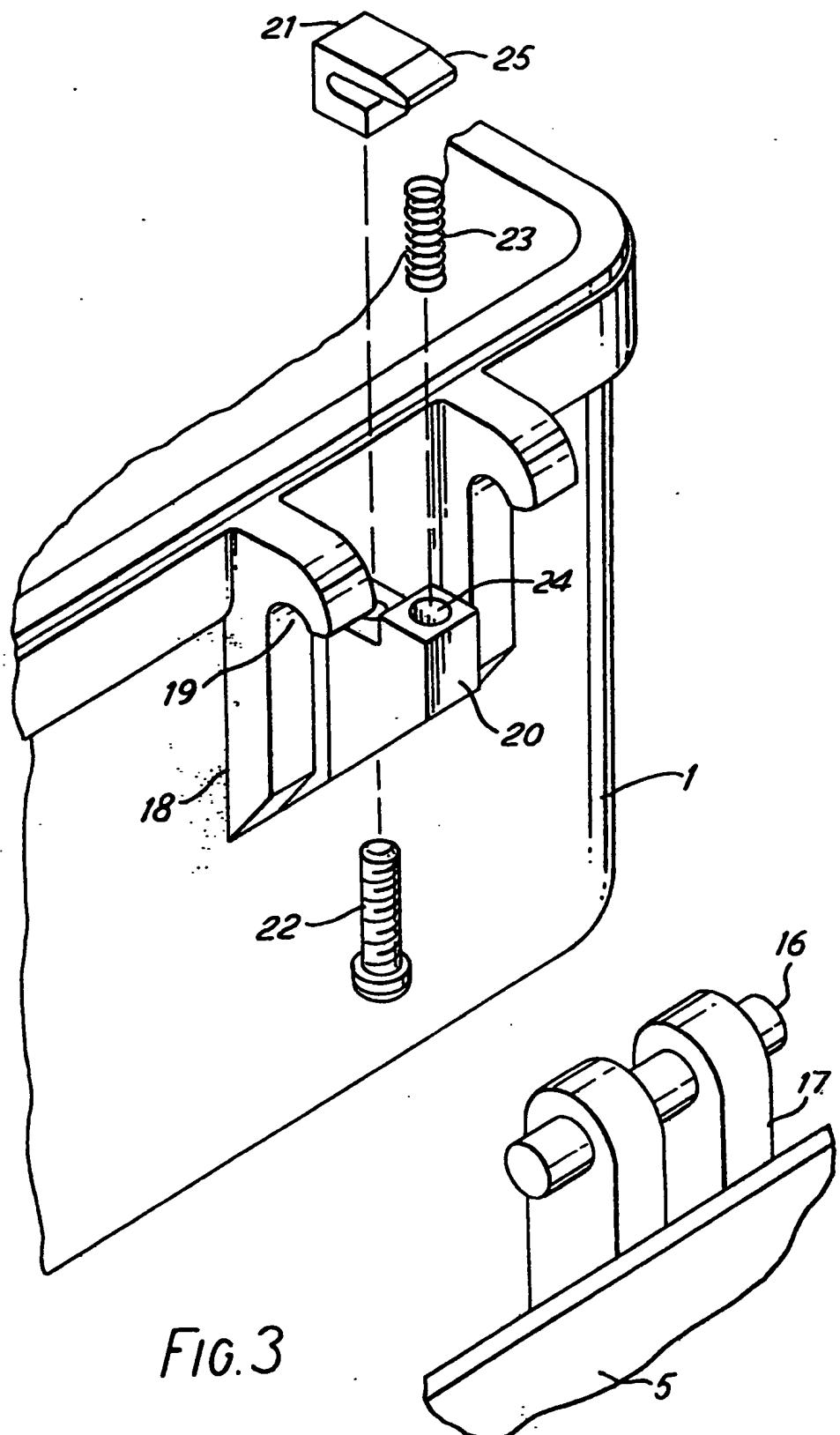
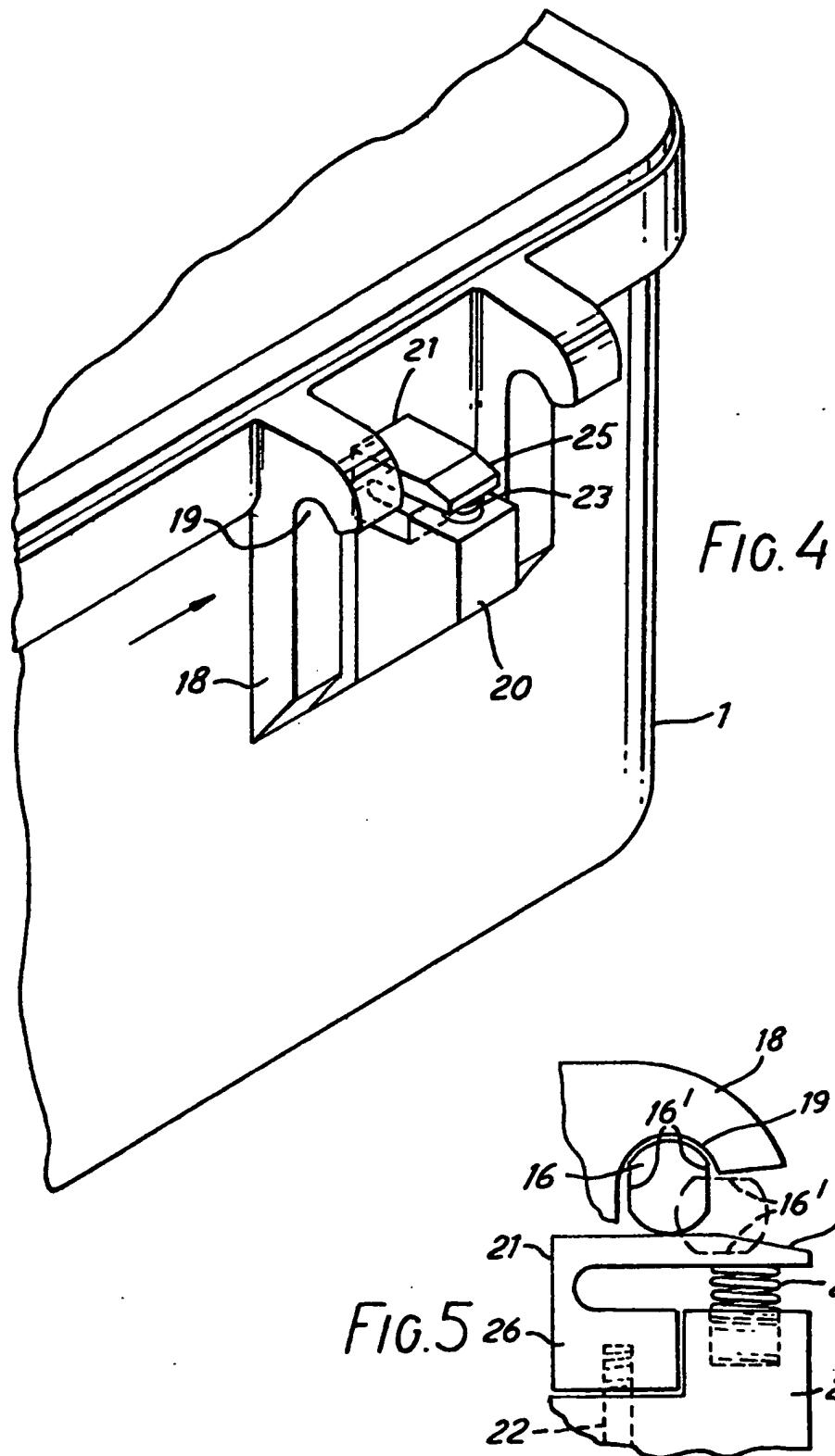


FIG. 3

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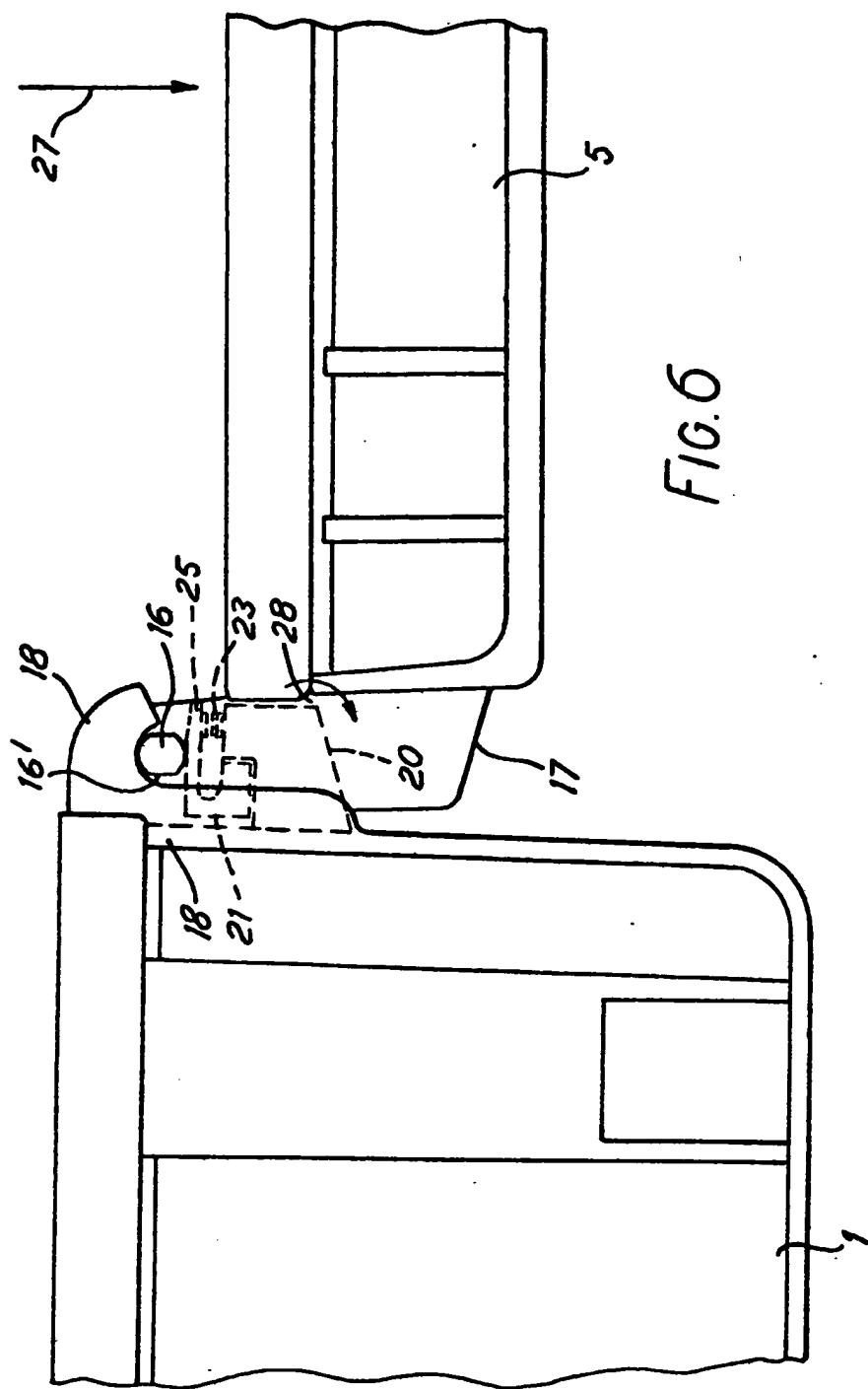


FIG. 6

SPECIFICATION

Hinges

- The present invention relates to hinges formed in two separable parts, in particular but not exclusively hinges joining an opening and removable lid to a box.
- In one example to which the invention is particularly applicable a box of plastics material is designed to protect equipment to be permanently housed therein, such as electrical measurement or test equipment. The equipment is conveniently mounted in the base of the box with parts to be used or viewed, including switches and meters, visible within the box. For complete protection the box is fitted with a lid, hinged for opening and with one or more suitable catches to retain the lid closed when desired. For use of the equipment in the box the lid is pivoted about the hinge or hinges to an open position. The lid may hold instructions, or, if desired, part of the said equipment or may conveniently form a tray for the convenience of the user of the equipment. It is convenient for the hinges to be in separable parts to allow the lid to be removed completely either for the convenience of the user or, in certain circumstances, to avoid the risk of a lid weighted by items held in it accidentally falling open from being held in a vertical position and so damaging the hinges or overbalancing the box.
- It is an object of the invention to provide an improved separable hinge which provides firm retention with easy separation when desired and in particular which can be readily adapted to allow for different weights of lid.
- According to the invention there is provided a hinge comprising two separable parts for hingedly connecting two objects, the first part including a pin member rigidly connected to one of said objects and the second part including at least one locating member rigidly connected to the second of said objects having a surface against which the pin member may be located to rotate on its axis therein and means for retaining the pin member against said surface, wherein the means for retaining includes a retaining member having a flexible part which is arranged to press said pin against said surface but which may be displaced to release said pin and a biasing means arranged to control the force needed to displace said flexible part.
- The invention also embraces a box having a base and a lid connected by a hinge according to the preceding paragraph.
- Preferably the force provided by the biasing means is set at a level such that the two parts of the hinge will be separated by a force applied to the lid less than that required to overbalance the box.
- In order that the invention may be clearly understood and readily be carried into effect the invention will now be described by way of example with reference to the accompanying drawings of which:

Figure 1 shows in perspective view the base of

- 65 a box having hinges in accordance with the invention;
- Figure 2 shows in perspective view the lid of the box of Figure 1,
- Figure 3 shows in perspective view one of said 70 hinges disassembled,
- Figure 4 shows the same view of the hinge of Figure 3 partly assembled,
- Figure 5 shows in elevation a detail of the hinge of Figure 3 fully assembled, and,
- 75 Figure 6 shows an end elevation of part of the box and lid of Figures 1 and 2, with the hinge assembled and the lid fully open.
- In Figure 1 there is shown in perspective view a part of the base 1 of a box which is intended to 80 house electrical instruments. The box is a moulding of modified polyphenol oxide, for example the material known as "NORYL" (Registered Trade Mark). The moulding is by the process of sandwich moulding which produces a 85 honeycomb structure in the centre of two solid walls. This process provides a structure which is suitably strong and impact resistant to provide the required degree of protection to the contents of the box.
- 90 The base 1 has a rim 2 at which a lid part is mated to close the box. At the inside edge of rim 2 is a ledge 3 and inside the box are a number of fixing posts 4. There is provided in use a panel (not shown) which is seated on the ledge 3 and 95 secured by being screwed to the posts 4. Where the electrical instruments include one or more meters, which is the primary use of the box, these are mounted on the underside of the panel to be viewed through apertures therein or mounted on 100 the outside with parts at rear through the apertures. Similarly other equipment including switches and terminations may be mounted on the panel and, for example, circuit boards may be suspended thereon. It is intended that sealing 105 material should be included between the ledge 3 and the panel to be compressed as the mounting plate is secured into place and to render the box base splash resistant for the contents.
- In Figure 2 there is shown also in perspective 110 view a lid 5 for the base of Figure 1, the lid 5 being of the same construction as the base 1. For the following discussion Figures 1 and 2 are discussed jointly and should be viewed together. The lid 5 has a lip 6 dimensioned to mate with the 115 rim 2 when the lid is closed.
- The box base and lid are provided with hinges 7 which will be discussed further hereinafter and catches 8. The catches comprise clip parts 9, made in this example of nylon which are hingedly 120 fixed to the lid 5 by pins 10 passing through holes 11 in protrusions 12 on the lid 5 and holes 13 in the clip parts 9 themselves. The clip parts 9 include protrusions 14 which engage with mating protrusions (not shown) in the base 1 to retain the lid 5 closed. They are biased to be normally closed by springs 15 and may be released by motion against these springs.
- In the preferred embodiment of the box, housing electrical instruments, the lid may be

simply for closure and protection but may have mounted thereon items such as instructions which are relatively light and may hold items such as probes which contribute significantly to the weight of the lid. Furthermore, when open and in use, the lid may conveniently be used to hold items related to the use of the instrument or parts of the equipment with which it is being used. For this reason at least it is convenient if the lid is relatively easily removable. It is also desirable that it should remain in position when opened until it is removed. Yet if it is overloaded so as to be at risk of damaging the hinge or overbalancing the box it is desirable for it to detach itself to avoid damage to the instruments in the box. To achieve this result the present invention provides a new form of hinge 7.

The hinge comprises two parts. Attached to, and in this example moulded integrally with, the lid 5, are for each hinge a pin 16 each pin supported by two support members 17. The pins 16 form the pivot of the hinges and are the axes about which the hinges rotate. They are, of course, disposed with their axes aligned. On the base 1 the other part of each hinge has two members 18, in this example moulded integrally with the base, having concave surfaces 19 shaped and adapted to receive pins 16. The surfaces are open at the lower side to release the pins 16 for separation of the lid.

Also included in each hinge is a support member 20 situated midway between the two members 18. The function of member 20 may be more clearly seen in Figure 3 which shows in perspective view a part of the box and one hinge 7. Mounted on the support member 20 is a retaining member 21, in this example made of nylon, which is held in position by a self-tapping screw 22 passing through member 20 and into the base of retaining member 21.

Retaining member 21 serves to retain the pin 16 on the lid hinge part, when in position, pressed upwards into the concave surfaces of members 18. In this position the support members 17 are situated either side of member 20 and between the two members 18 and member 20. To assist in this a biasing spring 23 is located in a hole 24 in member 20 and pushes up against a tongue part 25 of member 21 to bias it upwards. The position of member 21 and spring 23 may more clearly be seen from Figure 4 which shows the same view as in Figure 3 but with those two members in place.

Figure 5 shows an elevational view of part of each of members 18 and 20 with member 21 and pin 16 in their operative position. It can be seen that member 21 comprises a relatively solid base part 26 with the relatively thin tongue part 25. Being made of a flexible material such as nylon, the tongue part 25 is capable of flexion to move vertically despite the firm fixing of base part 26. As illustrated, with the lid in position, the tongue is in its relaxed position holding pin 16 into the concave surface 19 of member 18 thus retaining the lid in position. Pin 16 is clearly capable of

rotation on its axis providing a hinge action and allowing opening and closing of lid 5. To retain pin 16 in this position despite the normal weight of the open lid the biasing spring 23 provides a suitable upwards force on tongue 25.

To separate the hinge parts and remove lid 5 it is necessary to move pin 16 through the position 16', shown in broken outline, so that it clears the end of member 18. This requires a downward movement of tongue 25 but the flexibility of member 21 and the strength of spring 23 are such as to permit this in response to a firm downward pressure on the lid 5. The downward pressure required to separate the base and lid hinge parts may readily be varied by the selection of different springs 23. For reassembly of the hinge, the lid is introduced to the base so that the pin 16 passes between the end of member 16 and tongue part 25. To facilitate this pin 16 is provided with flats 16' which are substantially parallel to the side of the lid. When the lid is closed or fully open (i.e. parallel to the base) these flats are perpendicular to the surface of tongue 25 and have no effect. However when the lid is half open (perpendicular to the base) the flats effectively reduce the diameter of pin 16 and allow easier refitting. Thus the invention allows not only ease of removal of the lid but importantly similar ease of replacement.

It has been mentioned that it is desirable for the lid to separate under abnormal conditions of load, stress etc. This is achieved by the selection of a spring 23 which permits separation at a suitable lid weight. This may be initiated as a result of any extra contents in the lid, but at one extreme, spring 23 should permit separation at a lid weight less than that required for overbalancing, taking into account the authorised contents of the box.

In the preferred embodiment illustrated the design is such as to facilitate the automatic separation of the lid. This aspect of the design may be seen from Figure 6 which shows in end elevation the hinge parts of the base and lid with the lid fully open. As explained hereinbefore the hinge action is provided by rotation of pins 16 on their axes and the lid therefore pivots about this axis. When an excess weight is placed in lid 5 a downward force as at 27 is provided. Since pins 16 can move, when the limit of pivoting about the axis of pins 16 is reached, a further pivoting action tends to occur at 28 about the lowest point of contact between base 1 and lid 5. This pivoting action with a downward component of force 27 forces pins 16 downwards, against the resilience of tongue 25 and spring 23 and outwards to be released from member 18. The lid 5 then drops the relatively short distance to the surface on which the box is standing.

Although this invention has been described in terms of a box for housing electrical instruments it will be appreciated not only that the box may be used for other purposes but also that the hinge of the invention is suitable for other purposes for which a separable hinge is required. In all such

applications the hinge of this invention permits easy and convenient separation and reassembly.

Claims

1. A hinge comprising two separable parts for hingedly connecting two objects, the first part including a pin member rigidly connected to one of said objects and the second part including at least one locating member rigidly connected to the second of said objects having a surface against which the pin member may be located to rotate on its axis therein and means for retaining the pin member against said surface, wherein the means for retaining includes a retaining member having a flexible part which is arranged to press said pin against said surface but which may be displaced to release said pin and a biasing means arranged to control the force needed to displace said flexible part.
2. A hinge according to claim 1 having two said locating members.
3. A hinge according to claim 2 in which a single retaining member disposed between the locating members serves to press the said pin thereagainst.
4. A hinge according to any of the preceding claims in which the biasing means is a spring.
5. A hinge according to any of the preceding claims in which the retaining member includes a rigid part adapted to be secured to the said second object, said flexible part being formed as a tongue part thereon.
6. A hinge according to claim 5 including a support member rigidly connected to said second object and in which the rigid part of the retaining member is secured to said support member.
7. A hinge according to claim 6 in which the support member includes an aperture retaining said biasing means to press against said flexible part.
8. A hinge according to any preceding claim in which the parts rigidly connected to the first and second object are formed integrally therewith.
9. A hinge according to any preceding claim in which the retaining member is made of nylon.
10. A hinge according to any preceding claims in which the pin is of substantially circular cross-section with at least one flat to reduce the displacement required of the flexible part, for one relative position of the separable parts, to facilitate reassembly.
11. A hinge according to claim 10 in which the hinge has two said flats.
12. A hinge substantially as herein described with reference to the accompanying drawings.
13. A box having a base and a lid connected by at least one hinge according to any of the preceding claims.
14. A box according to claim 11 wherein the lid is the first object and the base is the second object.

15. A box according to either claim 11 or claim 12 connected by two said hinges.

New claims or amendments to claims filed on 13th Dec 1982.

65 Superseded claims 1—15 inc.

New or amended claims:

1. A hinge comprising two separable parts for hingedly connecting two objects, the first part including a pin member rigidly connected to one of said objects and the second part including at least one locating member rigidly connected to the second of said objects having a surface against which the pin member may be located to rotate on its axis therein and means for retaining the pin member against said surface, wherein the means for retaining includes a retaining member having a flexible part which is arranged to press said pin against said surface but which may be displaced to release said pin and a biasing means arranged to control the force needed to displace said flexible part and wherein the pin member is of substantially circular cross-section with at least one flat to reduce the displacement required to the flexible part, at one relative position of the separable parts, to secure release or reassembly.
2. A hinge according to claim 1 having two said locating members.
3. A hinge according to claim 2 in which a single retaining member disposed between the locating members serves to press the said pin thereagainst.
4. A hinge according to any of the preceding claims in which the pin member has two said flats.
5. A hinge according to any of the preceding claims in which the biasing means is a spring.
6. A hinge according to any of the preceding claims in which the retaining member includes a rigid part adapted to be secured to the said second object, said flexible part being formed as a tongue part thereon.
7. A hinge according to claim 6 including a support member rigidly connected to said second object and in which the rigid part of the retaining member is secured to said support member.
8. A hinge according to claim 7 in which the support member includes an aperture retaining said biasing means to press against said flexible part.
9. A hinge according to any preceding claim in which the parts rigidly connected to the first and second object are formed integrally therewith.
10. A hinge according to any preceding claim in which the retaining member is made of nylon.
11. A hinge substantially as herein described with reference to the accompanying drawings.
12. A box having a base and a lid connected by at least one hinge according to any of the preceding claims.

13. A box according to claim 12 wherein the lid is the first object and the base is the second object.

14. A box according to either claim 12 or claim
5 13 connected by two said hinges.

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